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Agricultural Research Service

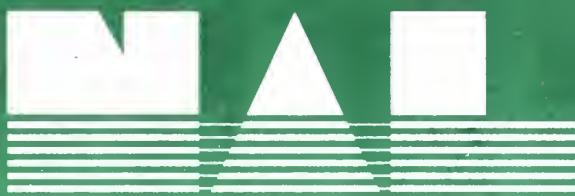


ANNUAL REPORT

C O T T O N D U S T / B Y S S I N O S I S R E S E A R C H

1983

**United States
Department of
Agriculture**



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INTRODUCTION

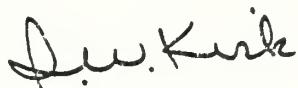
Byssinosis was brought to the attention of the cotton textile industry in the 1970's by the identification of cotton dust as a target health hazard, and by the Occupational Safety and Health Administration's (OSHA) adoption of a permissible exposure level for cotton dust. A broad program of research on cotton dust has been sponsored by USDA-ARS since 1973 and coordinated with research sponsored by industry.

Initially, major emphasis was on measuring, controlling and suppressing cotton dust to help meet OSHA standards. Substantial progress has been made in this area. Research in CY 1981 and beyond has been and will be concentrated on the determination of the causative agent(s), and the development of animal and/or cellular bioassays which accurately reflect the byssinotic condition. Until such bioassays become available, however, human exposure testing which is lengthy, costly, and difficult to manage and analyse, is the only means available to assess research results. In this latter endeavor, the close involvement and cooperation of the National Institute of Occupational Safety and Health (NIOSH) has been secured through an Interagency Agreement between NIOSH and ARS.

Pending the development of model bioassays noted above, a cooperative program with NIOSH and industry is also underway to find practicable means for removing and/or deactivating the causative agent(s) by washing or chemical treatment. Prevention of initial contamination by changes in varieties and methods of cultivation, harvesting and ginning are longer-range alternatives that are being pursued in the event washing or deactivation prove infeasible.

A staff assessment of ARS's contribution to the cotton dust/byssinosis research effort was made in February 1980 shortly after industry representatives presented a request and plan for a crash research program. The amounts of direct and indirect contributions noted on the CRIS project identification were the basis for USDA/ARS'S FY 1980 program effort of \$2.6 million. In developing this report, we have used the original estimates on continuing programs and have made similar estimates for new and redirected programs. The FY 1981 program, which included redirected resources and new appropriations, represented an investment of approximately \$5.3 million in cotton dust/byssinosis research in USDA/ARS. The FY 1983 effort has remained near this level.

This fourth Annual Report describes the progress made during 1983 in the USDA/ARS intramural and extramural programs, sets forth the planned directions for 1984, and records publications resulting from the research since the third Annual Report. A list of the scientists conducting this research, their CRIS Work Units, and the amount of scientific effort assigned to each Unit is included. Firm conclusions should not be drawn from preliminary results reported in this document since they represent incompletely completed research.



IVAN W. KIRK
Director, SRRC, and
Coordinator, Southern Region
Byssinosis Program

New Orleans, LA
June 1, 1984

CURRENTLY ACTIVE CRIS WORK UNITS

CONTRIBUTING TO RESEARCH ON COTTON DUST

CY 83 - 84

<u>LOCATION</u>		<u>SY's</u>
Southern Regional Research Center P.O. Box 19687 New Orleans, LA 70179 (pp. 1-17)		19.8
7102-20831-007 (100% direct)	Determination of possible causative agent of byssinosis in cotton dust and its correlation to a bioassay	5.0
7102-20831-008 (100% direct)	Determination of endotoxins in cotton dust	4.0
7102-20831-012 (100% direct)	Examination and possible identification of byssinogenic materials using immunochemical techniques	1.5
7102-20831-013 (100% direct)	Characterization of the chemical and physical properties of washed cotton and related dusts	3.4
7102-20831-014 (100% direct)	Evaluate methods for the determination of dust levels in cotton	1.5
7102-20831-015 (100% direct)	Modification of cotton dust properties by selected vapor phase treatments	1.0
7102-20555-025 (100% direct)	Application of electrostatic forces to the production of clean cotton fibers	3.4

Cotton Quality Research Unit
P.O. Box 792
Clemson, SC 29633 (pp. 18-23)

5.0

7708-20550-004 (80% direct)	Cotton fiber testing instruments and measurement techniques	2.6 (3.2)
7708-20550-006 (100% direct)	Methods of measuring and limiting cotton dust emission during processing	1.1
7708-20830-001 (100% direct)	Panel studies to identify or eliminate substances in cotton dust causing respiratory problems in workers	1.3

Cotton Pathology Research Unit
P. O. Box JF
College Station, TX 77841 (pp. 24-25)

1.3

7302-20830-001* Fundamental research on bioassays and
(100% direct) causative agents of byssinosis

1.3

*A cooperative project with Veterinary Toxicology and
Entomology Research Laboratory, College Station, TX

Biological Waste Management and Organic
Resources Laboratory
Beltsville, MD 20705 (pp. 26-27)

1.5

1103-20793-008 Microorganisms as a possible cause of
(100% direct) byssinosis, a pulmonary disease of
cotton mill workers

1.5

Southern Plains Cotton Research Laboratory
Route 3, Box 215
Lubbock, TX 79401 (pp. 28-32)

2.1

7313-20190-004 (60% direct)	Foreign material reduction in stripper harvested cotton	0.5 (0.9)
7313-20550-004 (70% direct) (30% indirect)	Interaction of cotton plant and fiber characteristics with mechanical cleaning	0.4 (0.5)
7313-20550-005 (70% direct) (30% indirect)	Improving cleaning systems for machine-stripped cotton	1.2 (1.7)
7313-20550-006	Production, ginning and quality studies on nondehiscent-boll cotton	0.0

U.S. Cotton Ginning Laboratory
P.O. Box 256
Stoneville, MS 38776 (pp. 33-37)

1.7

7402-20550-004 (40% direct)	Production, ginning and quality studies on midsouth cotton varieties	0.5 (1.2)
7402-20550-005 (20% direct)	Ginning machinery and methodology to preserve fiber quality	0.6 (3.1)
7402-20550-007 (80% direct)	Improving the working environment in cotton gins	0.6 (0.7)

Total

31.4

Scientists Contributing to Research on the
Cotton Dust Problem

SOUTHERN REGIONAL RESEARCH CENTER
1100 Robt. E. Lee Blvd.
P. O. Box 19687
New Orleans, LA 70179

Dr. Ivan W. Kirk
Center Director and
Southern Region Coordinator
FTS 682-7511

Industrial Environmental Health Research Unit

Dr. Ralph J. Berni, RL	FTS 682-7547
Gordon J. Boudreaux, Chemist	-7048
Joseph S. Bruno, Research Chemist	-7562
Edwin A. Catalano, Chemist	-7552
Leon H. Chance, Research Chemist	-7561
Dr. Linda Domelsmith, Research Chemist	-7562
Dr. Samuel E. Ellzey, Jr., Research Chemist	-7561
Dr. William E. Franklin, Research Chemist	-7567
Dr. Joseph G. Montalvo, Jr., Research Chemist	-7045
Nancy M. Morris, Research Chemist	-7552
Biagio Piccolo, Chemist	-7059
Andrew G. Pierce, Jr., Research Chemist	-7059
Marie Alice Rousselle, Research Chemist	-7567
Dr. Antonio A. Sekul, Research Chemist	-7562
James B. Stanley, Chemist*	-7038
Ricardo H. Wade, Research Chemist	-7561
James H. Wall, Research Chemist	-7596

Fiber Structure - Physics and Chemistry

Dr. Ruth R. Benerito, RL	-7566
Wilton R. Goynes, Jr., Research Chemist	-7554
Oscar Hinojosa, Research Chemist	-7048, 7081
Truman L. Ward, Research Chemist	-7566

Fiber and Yarn Processing Research Unit

Albert Baril, Jr., RL	-7582
Dr. James M. Hemstreet, Research Physicist	-7541
Dr. Kearny Q. Robert, Jr., Research Physicist	-7541
Louis C. Weiss, Research Physicist	-7541

*Attached to Food and Feed Quality Research Unit

COTTON QUALITY RESEARCH STATION
P.O. Box 792
Clemson, SC 29633

C. Kenneth Bragg
Research Leader
FTS (803) 656-2488

Cotton Quality Research Unit

Jefferson D. Bargeron, III, Res. Textile Technologist	-2488
Joseph B. Cocke, Agricultural Engineer	-2488
L. C. Godbey, Textile Technologist	-2488
John S. Graham, Res. Textile Technologist	-2488
R. E. Harrison, Textile Technologist	-2488
Henry H. Perkins, Jr., Research Chemist	-2488
Robert A. Taylor, Mechanical Engineer	-2488

COTTON PATHOLOGY RESEARCH UNIT
P.O. Box JF
College Station, TX 77841

Alois A. Bell
Research Leader
FTS 527-1232

Cotton Pathology Research Unit

Dr. Marcel H. Elissalde, Res. Physiologist**	-1368
Dr. Robert D. Stipanovic, Research Chemist	-1232
Dr. Richard L. Ziprin, Microbiologist**	-1374

BELTSVILLE AGRICULTURAL RESEARCH CENTER
Building 003, BARC-West
Beltsville, MD 20705

Dr. Paul A. Putnam
Center Director

Biological Waste Management and organic
Resources Laboratory, AEOI

Dr. James F. Parr, Jr.
Chief

Dr. Paul B. Marsh, Res. Microbiologist	FTS 344-3163
Patricia D. Millner, Res. Microbiologist	-3163
Dr. Marion E. Simpson, Res. Microbiologist***	-3163

** Attached to VTERL

*** Attached to Ruminant Nutrition Laboratory, ASI

SOUTHERN PLAINS COTTON RESEARCH LABORATORY
Route 3
Lubbock, TX 79401

Dr. Jerry E. Quisenberry
Director
FTS 738-7413

Cotton Ginning Research Unit

Roy V. Baker, Jr., RL	-7011
Joseph W. Laird, Agr. Engineer	-7011

Cotton Production and Engineering Research Unit

Dr. Donald F. Wanjura, RL	-7413
Dr. Alan D. Brashears, Agr. Engineer	-7413

U.S. COTTON GINNING LABORATORY
P.O. Box 256
Stoneville, MS

Anselm C. Griffin, Jr.
Director
FTS 497-2402

Cotton Ginning Research Unit

William S. Anthony, Agr. Engineer	-2402
Eugene P. Columbus, Agr. Engineer	-2402
Gino J. Mangialardi, Jr., Agr. Engineer	-2402
Samuel T. Rayburn, Jr., Agr. Engineer	-2402

Cooperators Contributing to Research on the
Cotton Dust Problem

Funded through Cooperative and Interagency Agreements and Contracts

<u>NUMBER</u>	<u>TITLE</u>	<u>COOPERATOR</u>
7005-20831-006A3 J. A. Wall ADODR-SRRC	Screening of cotton dusts for biological activity	Dr. Brian T. Butcher Clinical Immunology Section Tulane Medical School 1700 Perdido Street New Orleans, LA 70112 (504) 588-5578
7007-20831-010C2 I. W. Kirk ADODR-SRRC	Model bioassays to detect byssinosis and correlate with lung function and known exposure data	Dr. Lee Richman EBON Research Systems 1118 9th Street, N.W. Washington, DC 20001
7008-20831-011A J. Robens ADODR-NPS	Development of a whole animal model that will reflect byssinotic condition	Dr. Meryl H. Karol Department of Indus. Environ. Health Graduate School of Public Health University of Pittsburgh Pittsburgh, PA 15261 (412) 624-2736
7009-20831-016A R. J. Berni ADODR-SRRC	Analysis of lung lavage fluid from subjects exposed to cotton dust/bract extracts	Dr. Marian M. Buck School of Medicine Yale University New Haven, CT 06520 88-203-785-4162
7820-20830-002A C. K. Bragg ADODR-CQR	Effect on the human respiratory system of exposure to dusts from agricultural products	Dr. Brian Boehlecke U. of North Carolina Chapel Hill, NC 88-919-966-2534
7006-20555-028A1 K. Q. Robert ADODR-SRRC	Theoretical and laboratory calibration of cotton dust samplers	Dr. V. A. Marple School of Engineering University of Minnesota Minneapolis, MN 55455 (612) 373-9984

7007-20555-029A
K. Q. Robert
ADODR-SRRC

Field study of the SRRC
sampler as a primary
instrumental criterion
for measuring cotton dust

Dr. S. K. Batra
North Carolina State Univ.
Box 5006
Raleigh, NC 27650
(919) 737-3231

Reimbursable
Agreement
I. W. Kirk
ADODO-SRRC

Control of cotton dust and
the causative agents of
byssinosis

Dr. Robert E. Glenn,
Director
Division of Respiratory
Disease Studies
Appalachian Laboratory for
Occupational Safety and
Health, National Insti-
tute for Occupational
Safety and Health
944 Chestnut Street
Morgantown, WV 26505
FTS 923-4127

ALOSH/NIOSH Investigators:

Dr. Robert M. Castellan, Clinical Investigations Branch (FTS 923-4223)
Dr. Pervis Major, Chief, Laboratory Investigations Branch (FTS 923-4518)
Dr. Philip R. Morey (IPA), Environmental Investigations (FTS 923-4421)
Dr. Stephen A. Olenchock, Chief, Immunology Section (FTS 923-4256)
Dr. Kenneth C. Webber, Chief, Physiology Section (FTS 923-4561)
Dr. Philip R. Miles, Physiology Section (FTS 923-4561)
Dr. Jeff Fedan, Physiology Section (FTS 923-4561)
Vincent Castranova, Physiology Section (FTS 923-4561)
Dr. D. G. Frazer, Physiology Section (FTS 923-4561)
Dr. Jane Ma, Physiology Section (FTS 923-4561)

Memorandum of
Understanding

Research on Causative
Agent(s) of Byssinosis

Dr. Marion Buck
Department of
Internal Medicine
Yale University School
of Medicine
New Haven, CT 06510
88-203-785-4162

RESEARCH PROJECTS, PROGRESS, PLANS, and PUBLICATIONS

of

CONTRIBUTING LOCATIONS

Southern Regional Research Center
 P.O. Box 19687
 New Orleans, Louisiana 70179
 Dr. Ivan W. Kirk, Director

INTRAMURALS

CRIS NO.	TITLE	TERMINATION DATE	SCIENTIFIC YEARS
7102-20831-007 (100% direct)	Determination of the causative agent of byssinosis in cotton dust and its correlation to a bioassay	09 Sep 85	R. J. Berni 40 L. H. Chance 100 L. M. Domelsmith 100 S. E. Ellzey 50 W. R. Goynes 30 J. H. Wall 100 J. B. Stanley 30 B. Piccolo 30 G. J. Boudreaux 20

PROGRESS

Elemental and proximate analyses have been conducted on cotton lint and bract samples from the Human Panel Acute Exposure Studies, USDA, Clemson, SC. Material derived from an aqueous extract of cotton dust and stabilized by derivatization with acetic anhydride/pyridine has been investigated by gas chromatography and GC-MS. A potassium-sensitive electrode analysis of the MQ-79 double-blind study cotton samples and associated statistical analyses demonstrate that potassium is a reliable marker for differentiating between washed and unwashed cotton. Research efforts have been directed toward obtaining ¹³C NMR data suitable for characterization of the water-soluble high molecular weight material isolated from cotton dust and shown to be antigenic in the rabbit and chimpanzee. A three-pulse, double spin echo sequence was written for the FX-900 NMR spectrometer and allows assignment of spin multiplicities to the signals through phase differences. Histamine HPLC methodology has been expanded to include tissue extracts and supernatants with quantitation of histamine released from chopped lung tissue on challenge with cotton bract extracts. An HPLC separation of 5-hydroxy-tryptamine (serotonin) in biological fluids has been developed. Spectroscopic evidence, including infrared, X-ray and gc/ms techniques, support microscopical evidence that calcium oxalate crystals are present in cotton leaves, bracts and dust.

PLANS

Characterize cotton dust and lint samples from Human Exposure Studies by chemical, chromatographic, and spectroscopic methods. Continue evaluation of biogenic amines in the cotton plant and in human biological fluids by HPLC methodology related to the acute response after inhalation of cotton dust. Continue to deactivate cotton dust by vapor phase and/or liquid systems. Synthesize needed standards.

ACCOMPLISHMENTS

Histamine Release Techniques Significantly Improved by Development of HPLC Methodology.

Histamine is a highly active substance widely distributed in animal tissues and responsible, in part, for anaphylactic shock. Sensitization reactions result in the release of histamine from tissues. Histamine release has been proposed as a mechanism for byssinosis. The bioactivity of drugs and chemicals can be assessed by measuring the histamine released from fragmented tissues. The limiting factor in histamine release studies is the quantitation of histamine. Development of HPLC histamine methods has made it possible to quickly identify an animal that is a "good" histamine releaser. Furthermore, the method has improved reproducibility in histamine release studies.

PUBLICATIONS

WALL, J. H., R. J. BERNI, AND M. G. BUCK. Analysis of Histamine in Biological Fluids by High Performance Liquid Chromatography. Proc. 7th Cot. Dust Conf. 114-118. (1983)

BUCK, M. G., E. N. SCHACHTER, AND J. H. WALL. Cotton Bract Airway Constrictor Agent: Its Chemical Characteristics and Its Effects on Human Airways. Proc. 7th Cot. Dust Conf. 22-25. (1983)

MULLER, L. L., J. M. SIMONEAUX, R. J. BERNI, AND J. H. WALL. Distribution of Lacinilene C and Lacinilene C 7-Methyl Ether in Cotton Plant Parts. J. Agr. Food Chem. 72-75. (1983)

WALL, J. H. AND E. B. LILLEHOJ. High Performance Liquid Chromatographic Separation of Xanthomegnin and Viomellein. J. Chromatog., 268: 461-468. (1983)

XIANG, Z., J. H. WALL, AND S. L. VAIL. Investigating the Reaction Course of N-Methylolation Reaction of Methyl Carbamate by NMR. AATCC Book Papers. 239-249. (1983)

BUCK, M. G., E. N. SCHACHTER, AND J. H. WALL. Acute Symptoms of Byssinosis. Chest (in Press)

7102-20831-008 Determination of endotoxins 30 Jul 85 N. M. Morris 100
 (100% direct) in cotton dust E. A. Catalano 100
Once
 M-A Rousselle 50
 W. E. Franklin 100
 G. J. Boudreaux 10
 B. Piccolo 10
 R. J. Berni 30

PROGRESS

A liquid chromatographic (HPLC) procedure for quantitating fatty acids hydrolyzed from lipopolysaccharides was developed. This procedure, which involved separation of the phenacyl esters of the fatty acids on a C₁₈ column, was four times more sensitive than the gas chromatographic procedure previously reported. Phenol-water extracts of cottons from the Human Panel Acute Exposure Studies at USDA, Clemson, SC, exhibited a high variability which was indicative of the heterogeneous nature of the samples. Surgical cotton appears to have a processing finish that precludes its use as a substrate for the comparison of extraction procedures. D-glycero-L-manno-heptose was synthesized from D-galactose up to the final crystallization step, which is underway. This enantiomer is indistinguishable from the natural heptose by chromatographic and spectrometric methods and will serve as a standard for the development of gc and gc/ms methods to analyze for bacterial endotoxins. A literature search has been started on occurrence and methods of analysis of isoprenoid quinones and/or microbial pigments produced by bacteria found in cotton samples or dust, to explore the possibility of using such products as indicators of the presence of bacteria in cotton.

PLANS

Analyze fatty acids from various extracts of cotton dust to develop a chromatographic procedure for intact lipopolysaccharides. Develop gc/ms methods to detect and quantitate monosaccharides characteristic of bacterial endotoxins. Determine effect of various additives (insecticide, herbicide, defoliant, etc.) on microbial contents of cotton dust.

PUBLICATIONS

None.

7102-20831-012 Examination and possible 25 Jan 86 A. A. Sekul 100
(100% direct) identification of materials using immunochemical S. E. Ellzey 50
techniques

PROGRESS

Freeze-dried aqueous extracts of cotton dust were separated into 85% methanol-soluble and -insoluble fractions. After the insoluble portion was subjected to ultrafiltration, a highly purified antigenic material was obtained and used for injection of two chimpanzees (Delta Primate Center) in order to induce formation of antibodies. Biweekly injections included a new, inactive tubercular bacillus-free adjuvant, N-acetylmuramyl-L-alanyl-D-isoglutamine-6-O-stearoyl. Double diffusion (Ouchterlony) tests for the presence of antibodies were carried out on blood samples drawn monthly. Results have been inconclusive thus far and showed that the animals had reacted slowly to the administered antigen(s). Normal ^{13}C NMR spectra of the antigenic material indicated at least 30 different carbons, and changes in the spectra over several months may indicate structural changes with time in the solution. Application of a new, multipulse sequence in the NMR work has allowed differentiation of signals due to CH_3 , CH_2 , CH , and unprotonated carbons.

PLANS

Biological activity of various cotton dust fractions will be examined by using smooth muscle preparations. Immunoassays of serum from chimpanzees injected with the cotton dust antigen(s) will be carried out to demonstrate the presence or absence of antibodies. Characterization of the structure(s) present in the purified cotton dust antigen(s) will continue by the use of non-standard, multipulse NMR experiments.

PUBLICATIONS

None

7102-20831-013 (100% direct)	Characterization of chemical and physical properties of washed cotton and related dusts	27 Oct 85	R. R. Benerito	30
			J. S. Bruno	100
			O. Hinojosa	30
			T. L. Ward	30
			R. J. Berni	30
			G. J. Boudreaux	10
			B. Piccolo	10
			A. G. Pierce	100

PROGRESS

Samples of bract, card dust and cottons were extracted with water or methanol so as to retain the bioactivity of the active ingredients. These extracts were separated by a newly developed HPLC method into several isolated fractions. These fractions are being compared to known standards with an HPLC and infrared spectrophotometer. A library of suspected compounds are being assembled on an IR computer to facilitate quick and accurate identification of the active compounds. The cleanliness of cottons and differentiation of washed and unwashed cottons were quantitatively (objectively) determined via measurements of contact angles of single fibers and of layers of parallel fibers and via thermal analyses. Changes in surfaces of washed and unwashed cottons were determined by scanning electron microscopy. Calcium oxalate crystals were isolated from cotton leaf, bract and dust.

PLANS

Develop separation and spectroscopic methods to isolate and identify potential byssinogenic agents in cotton, washed cotton, and cotton dust extracts. Statistically analyze variations of contact angles of washed cottons with surface and bulk elemental analyses and their properties. Determine location and relative concentrations of calcium oxalate in cotton.

ACCOMPLISHMENTS

Contact Angle Goniometer Accessory Differentiates Washed and Unwashed Cotton.

An accessory for the contact angle goniometer was designed and fabricated so that contact angles of single fibers could be measured. The method allows for differentiation of washed and unwashed cottons and a comparison of contact angles of single fibers with those obtained on bundles or pellets derived from some samples. These data are useful for statistical analyses that will indicate which method for determination of contact angle can be used to objectively differentiate washed and unwashed cottons for the textile industry.

PUBLICATIONS

BRUNO, J. S. HPLC Separation of Cotton Bract Extract. Separation Science and Technology (In Press)

GOYNES, W. R., J. H. CARRA, AND R. J. BERNI. Changes in Cotton Fiber Surfaces Due to Washing. Text. Research J. (In Press).

7102-20831-014 (100% direct)	Methods for the determination of dust levels in cotton	12 Jan 85	J. G. Montalvo M-A Rousselle B. Piccolo G. J. Boudreaux	80 50 10 10
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PROGRESS

Conductance (CON), water soluble reducing substances (WSRS), boiling water extractibles (BWE), and ash contents (ASH), were used to determine the wash status of 17 cottons from the Human Panel Acute Exposure Studies held at USDA-Clemson. Coefficients of variation were determined from lowest to highest: CON < BWE < WSRS < ASH. Single variate discriminate analysis indicated correct classification of wash status for all four tests: CON and ASH indicated 100% accuracy. Mean assay values from the four tests were used as independent variables; Δ FEV₁ values, obtained from human panel acute exposure studies with these same cottons, were used as the dependent variable to determine one and two-variable regression models. The two-variable model of WSRS and CON accounted for 85% of the variation in Δ FEV₁ values; the BWE and ASH model accounted for 71% of the variation. Both of these models are good predictors of Δ FEV₁ values. Preliminary studies indicate that it is also possible to relate Δ FEV₁ values to sample composition, as measured by near infrared spectroscopy. Comparing the impurity levels in washed, mechanically cleaned and the control (uncleaned) cotton, it was shown that mechanical cleaning of cotton on a Shirley Analyzer resulted in only slight reduction in the impurities in cotton; large decreases in all impurity values were found after water washing. Additional Shirley Analyzer studies indicated biases in the ASTM Shirley Analyzer method of testing for visible waste.

PLANS

Explore presumptive test to track byssinogenic activity in isolation and purification of the causative agent. Base the test on correlation of

FEV₁ data, from subjects exposed to cotton dust, and dust composition, as measured by near ir. Use the test to choose for causative agent analysis, those fractions of dust extracts that give a positive presumptive test.

PUBLICATIONS

ROUSSELLE, M. A., J. G. MONTALVO, JR., AND A. BARIL, JR. Chemical Profiling of Washed and Mechanically Cleaned Cotton. *Textile Res. J.* 53(2):60-70 (1983).

BERNI, R. J., J. G. MONTALVO, JR., H. PERKINS, AND S. BUCO. Differentiation of Washed and Unwashed Cotton. Wakelyn, P. J. (ed.) *Proc. 7th Special Session on Cotton Dust.* NCCA, 126-129 (1983).

MONTALVO, J. G., JR. AND J. G. MANGIALARDI, JR. Systematic Errors in Shirley Analyzer Measurements. *Textile Res. J.* 53(7):408-414 (1983).

MONTALVO, J. G., JR., S. E. FAUGHT, M-A ROUSSELLE, H. H. PERKINS, AND J. COCKE. Presumptive Test to Track Byssinogenic Activity in Causative Agent Analysis of Cotton Dust. *Proc. 8th Sess. Cot. Dust.* (In Press).

PARNELL, C. B., JR., A. GRACI, S. P. CLARK, AND B. M. NORMAN. Engineering Controls to Lower Dust Levels in Cottonseed Oil Mills. *Am. Soc. Agr. Eng. Trans.* 170-174 (1982).

7102-20831-015 Modification of cotton 14 Dec 83 R. H. Wade 100
(100% direct) dust properties by
 selected vapor phase
 treatments

PROGRESS

Interfacing a HPLC Varian 5000 Model with the central HP1000 computer for automatic data collection was completed. Several required computer programs were written to capture and process the real-time HPLC data in an asymmetrical real-time frame. Testing and debugging of these programs are almost completed and manuscripts are being prepared. Cotton plants were started in a new greenhouse to provide a continuous-limited supply of fresh and dried plant parts which will be used as a known reference source material for various chemical treatments. Runs to establish a small HPLC data base using these programs have been completed and are being analyzed. The new data base and new HPLC techniques will be used in future work in byssinosis research. Significant vapor phase reduction of endotoxin in laboratory experiments was effected using trifluoroacetic acid, aqueous ammonium hydroxide, and oxygen as hydrogen peroxide and ethylene oxide. Cost of treatment and state of art will determine the method used to reduce lipopolysaccharide (LPS). Ethylene oxide appears to be nearer the practical commercial single agent application and recovery system than the ammonia which would need a secondary scavenger agent. Strong acid vapor was the most effective LPS reducing agent, but costs more, and required a secondary scavenger agent. Acid may prove useful in a rinse or spray application.

PLANS

None. CWU terminated. Resources assigned 7102-20831-007.

PUBLICATIONS

WADE, R. H. Elimination of Possible Byssinogenic Constituents in Cotton Dust by Vapor Phase Treatments. Proc. 7th Cotton Dust Res. Conf., Beltwide Cot. Prod. Conf. 119-120 (1983).

WADE, R. H. Vapor Phase Treatments to Deactivate Endotoxins. Text. Research J. 53 615-619 (1983).

7102-20555-025 (100% direct)	Applications of electro- static forces to the production of clean cotton fibers	29 Apr 85	A. Baril J. M. Hemstreet K. Q. Robert L. C. Weiss	40 100 100 100
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PROGRESS

The properties of horizontal plane arrays of equally-spaced A.C. electrodes ("electric curtain" plate) were studied experimentally and theoretically. The Electrosweep process was used to remove trash and dust from beneath a prototype cotton-carding machine. Variables documented were: Cotton condition, amount, cleaning rate, production rate, moisture content, and cleanliness of the card teeth. The rate and amount of trash released were quantitated. When the electric curtain panel operated on the by-product from cottonseed or sunflower seed processing, separation occurred. The velocities of standard (lycopodium) particles were measured on a 2-phase electric curtain panel by a laser Doppler anemometer (LDA). Two distinct modes of motion were found: a low-velocity mode near the surface, and a high-velocity mode higher off the plate. On a 3-phase panel at low voltages, some levitated particles were trapped in circular orbits. The particles that were transported moved in cycloidal paths. Fundamental theoretical investigations of the behavior of ideal particles were pursued through simulations of 3-phase charged-particle orbits on the computer. Three types of particulate behavior were predicted by the model: "sliding" on the plate, "hopping" in cyclic contact with the plate, and "flying" in cycloidal paths with complete levitation.

PLANS

Quantitative measurements will be made on the 3-phase panels with the LDA. The computer model will be refined and validated against experimental measurements, and used to parameterize experimental data in order to elucidate mechanisms of particle transport and separation. Attempts will be made to use the computer model to design an electric curtain for the underside of a full-scale carding machine.

PUBLICATIONS

BARIL, A., JR. AND D. P. THIBODEAUX. Electro Kinesis of Particulate and Fibrous Matter. Accepted by Particulate Science Technology.

WEISS, L. C. AND D. P. THIBODEAUX. Separation of Seed By-Products with an A.C. Electrical Field. J. Am. Oil Chem. Soc. 61: 886-889 (1984)

ENSMINGER, D., J. G. MONTALVO, JR. AND A. BARIL, JR. Application of Ultrasonic Forces to Remove Dust from Cotton. Accepted by Trans. ASAE, J. Engineering for Industry.

WELLER, H. W., JR. AND A. BARIL, JR. Transport of Cotton Fibers by Electric Fields. Accepted by Particulate Science Technology.

EXTRAMURAL

7005-20831-006A3
Tulane U.
B. T. Butcher

Screening of cotton dusts
for biological activity

30 Sep 84

J.H. Wall
ADODR

PROGRESS

The aim of this study was to determine the effect of aqueous cotton dust extract (ACDE) on lung lavage cells of ACDE exposed and unexposed rabbits and to compare these responses with those seen in peripheral blood leucocytes. Analysis of total white blood cell (WBC) counts on peripheral blood samples demonstrated that exposure to ACDE did not alter total WBC counts. Polymorphonuclear neutrophils (PMN) and platelets were increased in some exposure groups; however, this was a non-specific response. ACDE elevated cyclic AMP (cAMP) levels in WBC, confirming earlier work with human peripheral blood mononuclear (MNL). In addition, the percent increase in cAMP stimulation by the beta-agonist, isoproterenol, in ACDE exposed animals was higher than controls, indicating an effect on the beta-adrenergic system. Lack of response in controls indicates the response results from dust contaminant(s) rather than fiber. Failure to demonstrate inter-group differences in the cAMP response in lavage cells probably reflects differences in the cell populations. Further, lavage cells (primarily alveolar macrophages) would likely receive greater exposure to ACDE than peripheral cells: thus lavage cell surface receptors could become desensitized. Previous work with human MNL indicates ACDE can desensitize cell receptors. Our studies indicate that while lung cells would be ideal for study, use of peripheral blood WBC to determine effects of ACDE on cAMP levels is appropriate.

PLANS

Continue immunological studies of whole guinea pigs exposed to cotton dust (high levels, long times). Focus on route of exposure (inhalation or subcutaneous injection of cotton/bract extracts) and aerodynamics of respiration systems, through use of intertracheal injections in rabbits. Determine origin (plant or microbiological) of 40 identified antigenic compounds extractable with water from cotton dust.

PUBLICATIONS

RYLANDER, R., P. HAGLIND, AND B. T. BUTCHER. Reactions during Workshift Among Cotton Mill Workers. *Chest* 84:403-407 (1983)

BUTCHER, B. T., C. E. O'NEIL, and R. N. JONES. The Respiratory Effects of Cotton Dust in Clinics in Chest Medicine. *Symposium on Immune Factors in Pulmonary Disease* 4(1):63-70 (1983).

O'NEIL, C. E., M. A. REED, L. AUKRUST, AND B. T. BUTCHER. Studies on the Antigenic Composition of Aqueous Cotton Dust Extracts. *Int. Arch. Allergy Appl. Immunol.* 72:294-298 (1983).

O'NEIL, C. E., B. T. BUTCHER, M. A. REED, AND J. E. SALVAGGIO. In vitro Effects of Aqueous Cotton Dust Extract on Leukocyte Cyclic Adenosine Monophosphate Levels. *Agents and Actions (In Press)*

BUTCHER, B. T., C. E. O'NEIL, M. A. REED, J. E. DIEM, AND G. SHARON. Humoral Antibody Response to Cotton Dusts. *Proc. 7th Cotton Dust Res. Conf.*, eds. P. J. Wakelyn and R. R. Jacobs. 19-21 (1983).

O'NEIL, C. E., M. A. REED, AND B. T. BUTCHER. In vitro Effects of Aqueous Cotton Dust Extract on Mononuclear Leukocyte Cyclic Adenosine Monophosphate Levels. *Proc. 7th Cot. Dust Res. Conf.* 97-100 (1983).

MUNDIE, T. G., J. D. OSGUTHORPE, C. MARTIN, B. T. BUTCHER, C. E. O'NEIL, AND S. K. AINSWORTH. The Effect of Inhalation of Cotton Dust, and History of Smoking, Allergy and Byssinosis on Immunoglobulin, Complement and Thromboxane Concentrations in Cotton Mill Workers. *Proc. 7th Cot. Dust Res. Conf.* 26-28 (1983).

7007-20831-010C3 Model bioassay to detect
EBON Research byssinosis and correlate
Assoc. with lung function and
L. Richman known exposure data

31 Mar 85

I. W. Kirk
ADODR

PROGRESS

Studies conducted in support of the ALOSH/NIOSH Reimbursable Agreement (RA) included the evaluation of the direct effects of a crude, water extract of cotton bract on tone in the isolated trachealis muscle of dogs and guinea-pigs, and the effects of cotton bract extract (CBE) on tension responses induced by electric field stimulation (EFS) of intrinsic excitatory and inhibitory nerves. CBE evoked contraction of both tissues, but in higher concentrations relaxed the guinea-pig trachealis. CBE potentiated EFS-induced relaxations of guinea-pig trachealis, but had a negligible effect on such responses in the dog tissue. These results indicate that species differences exist in the effect of CBE on airway smooth muscle, and that there exists an effect of CBE on neurotransmission to the muscle which may influence the neural control of its tone.

PLANS

Continue the cooperative studies in support of Reimbursable Agreement No. 58-7B30-1-337 with NIOSH.

PUBLICATIONS

See publications J. S. Fedan, et al; and P. R. Miles, et al reported under ALOSH/NIOSH RA

7008-20831-011A1 Development of a whole
U. of Pittsburg animal model that will
M. H. Karol reflect byssinotic
condition

01 Sep 85

J. Robens
ADODR

PROGRESS

Monday post-shift respiratory responses have been observed in guinea-pig after repeated exposure to cotton dust. A similar response was obtained after inhalation of E. Coli endotoxin. Gram negative bacterial, thermophilic bacteria and fungal counts in the cotton dust atmosphere, created by re-suspending dust collected from the condenser waste system of a textile mill, resembled those typically found for cardroom dust. Therefore, it was concluded that the rodent exposure regeneration system had not caused change in the microbiological flora of the cotton dust. Inhalation of cotton dust by guinea-pigs resulted in increased respiratory frequency and decreased tidal volume; maximum effects were noted after 18 hours exposure. Control animals showed no response. A concentration-response relationship was observed when the cotton dust concentration in the exposure chamber was varied from 1 to 27 mg/m³ of air. These results will permit comparison between potencies of various grades and sources of dust, as well as the determination of the effectiveness of washing procedures.

PLANS

Continue the study on the chemical exposure of animals to cotton dust.

PUBLICATIONS

Monday Post-Shift Respiratory Response in Guinea Pigs Following Inhalation of Cotton Dust. Y. Alarie, M. Ellakkani, D. Weyel, S. Mazumdar and M. Karol.

Concentration-Response Relationship for the Acute Respiratory Response to Inhaled Cotton Dust in Guinea Pigs. M. Ellakkani, Y. Alarie, D. Weyel, and M. Karol.

Systems for the Generations of Respirable Particles from Bulk Cotton Dust. D. Weyel, Y. Alarie, M. Ellakkani, P. Sasser and M. Karol.

Characterization of the Bacterial and Endotoxin Content of Cotton Dust Causing Respiratory Reactions in Guinea Pigs. M. Karol, L. Sinagoga, S. Burke, M. Ellakkani, G. Keleti, J. Sykora, Y. Alarie and D. Weyel. Proc. 8th Cot. Dust Res. Conf., Atlanta, GA, January 9-10, 1984. Ed. P. J. Wakelyn and R. R. Jacobs.

Pulmonary Reactions to Inhaled Cotton Dust: An Animal Model for Byssinosis. M. Ellakkani, Y. Alarie, D. Weyel, A. Mazumdar and M. Karol. Accepted by Toxicol. Appl. Pharmacol.

7008-20831-016A Analyses of lung 31 Jul 84 R. J. Berni
Yale University lavage fluid from ADODR
M. M. Buck subjects exposed
 to cotton dust/
 bract extracts

PROGRESS

Initial extracts of cotton dust and bract were prepared for use in human exposure studies via nebulizer. Plans were completed for the characterization of all body fluids to be collected pre- and post-exposure to the extracts.

PLANS

Assess the acute stage of byssinosis. Expose human subjects to cotton bract extracts via nebulizer. Determine lung functions pre- and post-exposure. Collect blood, urine, and lung lavage fluids and analyze these body fluids by blood cell counts, Ig's on serum, chemotactic assay on lung lavages, super-oxide release from macrophages, albumin contents and other bioassays as necessary.

PUBLICATIONS

SCHACHTER, E. N., M. G. BUCK, W. W. MERRILL, T. J. WITEK, AND P. ASKENASE. Immunologic Approaches to Byssinosis. Proc. 8th Cot. Dust Res. Conf., Atlanta, GA. Ed. P. J. Wakelyn and R. R. Jacobs.

7006-20555-028A
U. of Minnesota
V. A. Marple/
K. Rubow

Theoretical and laboratory
calibration of cotton dust
samplers

31 Oct 84

K. Q. Robert
ADODR

PROGRESS

SRRCC and VE samplers were investigated under controlled crossflow conditions. The materials and methods used in this experimental study were similar to those previously reported for sampling from calm air, except that in this case the samplers were placed in a low-speed horizontal wind tunnel instead of the aerosol test chamber. Monodisperse aerosol plus filtered room air was drawn into the inlet of the wind tunnel and passed through two different test sections. The first test section consisted of a 20 X 20-inch square duct. The second had a 14-inch circular cross-section. The airflow velocities in these two sections could be varied from 0.14 to 3 meter/sec in the first section, and from 3 to 10 meter/sec in the second. The actual aerosol concentration in the wind tunnel was determined by use of an isokinetic sampling probe. Four particle sizes (6, 10, 15, and 20 micrometers) were used at five wind velocities (0.25, 0.5, 1.0, and 3.0 meters/second). The results indicate clearly that the flow pattern inside the VE is coupled to the external crossflow, and that collection efficiency varies with crossflow velocity, even when the crossflow is turbulent.

PLANS

A manuscript is being drafted for reporting the calm-air results for the VE Sampler. Another manuscript is being written for publication of the wind-tunnel results. The final report is being prepared.

PUBLICATIONS

RUBOW, K. A., V. A. MARPLE, AND K. Q. ROBERT. Sampling Characteristics of the SRRCC Cotton Dust Sampler in Calm Air. Proc. Beltwide Cot. Prod. Res. Conf., Spec. Sess. Cot. Dust. 141-143 (1983). Ed. P. J. Wakelyn and R. R. Jacobs.

7007-20555-029A
North Carolina
State U.
S. K. Batra/
P. R. Hersh

Field study of the SRRC
sampler as a primary
instrumental criterion
for measuring cotton
dust

30 Sep 84

K. Q. Robert
ADODR

PROGRESS

All of the experimental work has been completed. The SRRC sampler was evaluated using an inlet jet size corresponding to a 35-micrometer AED cut-off, and the platform-spacing/jet-diameter ratio (S/D) was varied from 0.6 to 0.8 in order to degrade the sampling cut of the SRRC sampler, and thus to increase the mass collected on the filter. It was concluded from studies in the Model Card Room that the SRRC sampler cannot be made equivalent to the VE by increasing the D or S/D parameters, at least as long as both samplers are operated at a flowrate of 7.4 Lpm. Samples were also collected from the opening, carding, drawing, roving, and ring-spinning areas of a cooperating mill. Analysis of the particle sizes with a simple (unimodel) theoretical log-normal distribution yielded no clearly identifiable differences between the geometric means of the dust collected by the three samplers (VE, SRRC-15, and SRRC-35). The raw data, however, seem to suggest a trimodel distribution. The gravimetric values also showed greater variability within samplers than between samplers. The variations between processing locations within the mill, however, were very significant. A thesis based on some of the completed project work was finished at NCSU. A second thesis on the particle size distribution measurements was partially completed.

PLANS

The analysis of data will be completed and interpretations of the data will be made. The thesis dealing with the particle distributions will be completed. The final report will be prepared and submitted. Research results will be published.

PUBLICATIONS

DESAI, T. D. Field Study of the SRRC Samplers--Gravimetric Measurements.
Thesis, North Carolina State University, Raleigh, North Carolina, 1983.

REIMBURSABLE AGREEMENT with NIOSH ON
"Cotton Dusts and Extracts: Pulmonary Responses"

PROGRESS

a. Acute Human Ventilatory Response

A group of selected human subjects was exposed to controlled concentrations of card-generated dust similar to the standard reference cotton dust recently supplied by Cotton Incorporated to other investigators. Spirometry was measured before and after six-hour exposures. The ventilatory response to this dust was typical of the acute and reversible obstructive effects observed upon exposure of these same subjects to dust from other commercially available cottons. Quantitatively, dust from the standard reference cotton is neither the most nor the least potent of the dusts investigated. It is concluded that the dust supplied by Cotton Incorporated is probably suitable as a standard dust with respect to acute respiratory effects.

b. Endotoxin Contamination

Cottons of three varieties, DPL61, GSA71, and SJ5, were each grown in three different locations in the United States: Mississippi Delta, California San Joaquin Valley, and Texas High Plains. Human subjects were exposed to card-generated cotton dusts in rooms remote to the card, and gram-negative bacterial endotoxin levels in the elutriated dusts were quantified. Endotoxin contamination of the dusts varied markedly as a result of the geographical area in which the cottons were grown. The data suggest that differences in endotoxin contamination may be related additionally to the variety of cotton. Acute pulmonary function changes as measured by the forced expiratory volume in one second were correlated better with concentrations of elutriated endotoxins than with gravimetric dust levels. It can be concluded from this study that area of growth and cotton variety can affect the endotoxin levels in card-generated cotton dust, and acute pulmonary function changes correlate well with airborne endotoxin concentrations.

c. Effects of Chemicals Associated with Cotton Dust

Alveolar macrophages are lung cells which kill and ingest bacteria and foreign particles. Thus, these cells serve as the first line of defense against airborne material. The effects of three natural products associated with cotton, i.e., gossypol, rutin, and catechin, on the function of rat alveolar macrophages were studied. These substances had no effect on cellular volume; i.e., they did not cause membrane leakiness. However, the products did have some inhibitory effects on the following physiological parameters: resting and particle-stimulated oxygen consumption; release of antibacterial substances (reactive forms of oxygen), ingestion of foreign particles; and the activity of acid phosphatase, a lysosomal enzyme which is responsible for digestion of ingested bacteria and/or particles. In general, gossypol was the most toxic of the chemicals tested and catechin was the least toxic. These results indicated that natural products associated with cotton dust can compromise alveolar macrophage function.

10/10/84

d. Surface Tension Properties of Cotton Dust

It has previously been shown that some surface active materials are part of or are adsorbed on cotton dust particles and that a combination of aqueous and organic solvents can remove most of the surface active materials from cotton dust. The present study showed that ammonium hydroxide alone can effectively extract surface active materials from cotton dust. In addition, a study was made with a Wilhelmy balance of the surface activity of gossypol, rutin, and catechin, three major metabolites of cotton. All three compounds have been shown to have some effects on lungs in experimental animal studies. They were studied alone and in combination with dipalmitoyl lecithin (DPL). The results of these studies indicated that gossypol may be the cotton dust component which is responsible for the surface activity of cotton dust.

e. Effects of Water Extract

The interactions of a crude, water extract of cotton bract with the smooth muscle of the guinea-pig trachealis were characterized further from two aspects: 1) Based on previous finding that cotton bract extract (CBE) potentiates relaxation responses induced by stimulation of intrinsic nonadrenergic, noncholinergic inhibitory nerves, which may use as a transmitter ATP or its breakdown product adenosine, the effect of CBE on ATP- and adenosine-induced responses was examined. The relaxation responses to these agents were potentiated. CBE may thus act at, or facilitate responses mediated by, purinergic receptors. 2) Contractile responses to crude CBE were compared with those to dialyzed or ashed CBE. Most of the contractile response-inducing activity was dialyzable, and was retained in ashed samples. Inorganic constituents, i.e., minerals, might contribute to bronchoconstrictor activity in cotton bract.

PUBLICATIONS

CASTELLAN, R. M., J. L. HANKINSON, S. A. OLENCHOCK, AND J. B. COCKE. Acute Human Ventilatory Response to Card-Generated Dust from Cotton Representing Reference Standard Cotton Dust. Proc. 8th Cot. Dust Res. Conf., Atlanta, GA, January 9-10, 1984. Ed. P. J. Wakelyn and R. R. Jacobs.

OLENCHOCK, S. A., R. M. CASTELLAN, AND J. L. HANKINSON. Endotoxin Contamination of Cotton: Area of Growth/Varieties. Proc. 8th Cot. Dust Res. Conf., Atlanta, GA, January 9-10, 1984. Ed. P. J. Wakelyn and R. R. Jacobs.

MILES, P. R., M. J. REASOR, C. A. GLANCE, AND V. CASTRANOVA. Effects of Chemicals Associated with Cotton Dust on Alveolar Macrophage Function. Proc. 8th Cot. Dust Res. Conf., Atlanta, GA, January 9-10, 1984. Ed. P. J. Wakelyn and R. R. Jacobs.

MA, J., C. WHITE, AND K. C. WEBER. Surface Tension Properties of Cotton Dust Extracts and Components. Proc. 8th Cot. Dust Res. Conf., Atlanta, GA, January 9-10, 1984. Ed. P. J. Wakelyn and R. R. Jacobs.

FEDAN, J. S., J. F. CAHILL, M. S. FRANCZAK, J. H. TUCKER, K. C. WEBER, AND P. MOREY. Effects of A Water Extract of Cotton Bract (CBE) in Isolated Guinea-Pig Trachealis Smooth Muscle (GPT). Proc. 8th Cot. Dust Res. Conf., Atlanta, GA, January 9-10, 1984. Ed. P. J. Wakelyn and R. R. Jacobs.

Cotton Quality Research Station
Clemson, SC 29633
C. K. Bragg, Researcher Leader, Research Textile Technologist

INTRAMURALS

7820-20550-004 (80% direct)	Cotton fiber testing instruments and measurement techniques	26 Aug 84	R. A. Taylor J. S. Graham C. K. Bragg L. C. Godbey	100 100 20 100
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PROGRESS

A calibration method was developed to improve consistency of measurements between video scanning cotton trashmeters. A dot pattern reference tile was fabricated to provide a stable reference for use in adjusting the response threshold level of each instrument. Results showed that trashmeters can be used to grade cotton for trash if a sufficient number of observations are taken. Additionally, the instrument can be used to stabilize the amount of leaf trash in cotton grade standards prepared by AMS. Study of sources of variation in cotton strength using the Spinlab HVI system demonstrated the need for an automatic brusher to replace the hand brushing procedure. The automatic brusher mechanism was installed on the HVI equipment used by AMS for cotton classification. Stress-strain curves from HVI fiber strength and elongation measurements were recorded to determine ways of analyzing and correcting for the random fiber crimp in test specimens. The results show that fiber crimp may account for the major portion of unexplained variation in strength measurements. Spectral reflectance and color measurements were made on trash components commonly found in cotton. These data indicated that it may be feasible to automate identification of grass and bark with the use of color measurement and image analysis.

PLANS

Improve the precision and accuracy of high volume instrument measurements of fiber properties. Investigate the influence of moisture on HVI measurements. Study spot contamination, dye uptake and color uniformity of cotton. Study drafting force variability and type and quantity of surface contaminants on cottons. Evaluate efficiency of the microdust and trash monitor.

ACCOMPLISHMENTS

Video scanning cotton trash meters evaluated for use in cotton marketing.

Two prototype video scanning instruments were evaluated for their potential use in high volume instrument testing systems. Both trash meters use a black and white television camera to scan the surface of a cotton lint

sample and automatically adjust for background differences in reflected light intensity from the cotton samples. Trash particles as small as 0.015 inches are measured. Number of trash particles and the percent of surface area covered by trash particles are recorded. A standardized method of calibration using a tile with simulated trash spots was developed. With this method repeatability of tests is within 0.10 leaf grades between instruments and within 0.15 leaf grades on cotton standards. Based on these results, AMS has incorporated these trash meters into the prototype high volume instrument system being implemented for cotton classification.

PUBLICATIONS

TAYLOR, R. A. Development of a scanning type cotton trashmeter using solid state technology. Proc. 7th Cot. Dust Res. Conf. Beltwide Cot. Prod. Res. Conf., National Cotton Council, Memphis, TN. January 1983.

TAYLOR, R. A. Cotton trash separation and measurement for market quality classification. Proc. 7th Cot. Dust Res. Conf. Beltwide Cot. Prod. Res. Conf., National Cotton Council, Memphis, TN. January 1983.

TAYLOR, T. A. Using high speed image analyses to estimate trash in cotton. Accepted for publication in Transactions of the ASME Journal of Engineering for Industry. 1983.

7820-20550-006 (100% direct)	Methods for measuring and limiting cotton dust emissions during processing	13 Sep 84	J. B. Cocke H. H. Perkins C. K. Bragg R. E. Harrison	40 10 20 40
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PROGRESS

The mass median diameter (MMD) of dust particles in the human exposure facility (HEF) was not affected by flow rate of conveying air from the card room or by the carding rate. Increased airflow rate resulted in transfer of more dust per time unit but at a lower concentration per unit volume. Transfer efficiency was greatest at the lower airflow rates, indicating a potential savings in energy utilization. MMD of dust particles trended lower and the total amount of dust available for transfer decreased when the airflow rate in the card dust collection system was increased. A hydrocarbon plus surfactant additive on cotton reduced the number of small dust particles in card room air. Equilibrium dust concentrations in the HEF were achieved 20 minutes after dust laden air was initially introduced from the card room, and, decreased rapidly when card processing ceased. Dust concentrations in the HEF are approximately 15 to 20 percent of concentrations in the card room. This difference is due primarily to the dilution effect of the conveying air and the HEF circulating air system. Card room dust concentrations were not affected by the volume of air used in an experimental lint cleaner air wash system. Cotton variety and washing treatments were two factors found to affect the VE/CAM dust measurement ratio.

PLANS

Evaluate the effect of variety, mill and gin processing and particle size distribution on vertical elutriator and continuous air monitoring measurements. Develop a method for pulverizing cotton waste into respirable dust particles and determine proportion of each component required to obtain a "standard" dust.

PUBLICATIONS

COCKE, J. B., AND C. K. BRAGG. Automated systems for dust characterization. Proc. ASAE Nat. Conf. Agric. Electronics Applications, Chicago, IL. December 1983. In press.

7820-20830-001 (100% direct)	Panel studies to identify or eliminate substances in cotton dust causing respiratory problems	18 Jun 84	J. B. Cocke C. K. Bragg H. H. Perkins R. E. Harrison	40 30 20 40
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PROGRESS

The acute pulmonary response of human subjects to cottons of grades low middling and higher was eliminated by simple warm water washing with a wetting agent included. The tannin levels and effects on pulmonary function were similar for cottons washed in 70% acetone or in water alone. Bacteria and endotoxin in dust and the adverse effect on pulmonary function of high microbiological content cotton were not completely eliminated by washing. Simple correlations between 5 exposure concentration indices (viable fungi, total bacteria, gram-negative bacteria, respirable dust and airborne endotoxin) and exposure related acute pulmonary response changes revealed significant relationships between all indices except viable fungi. This supports the hypothesis that endotoxin plays a major role in pulmonary response to cotton dust. Alterations in lung mechanical function after cotton dust exposure were detected by maximal expiratory volumes and flows, and forced random noise impendence parameters, but not by body plethysmography. Measures of the Thevenin resistance by the forced random noise method are reliable indicators of cotton-induced broncho-constriction; but these methods are more appropriate for group studies and should remain adjuncts to standard spirometry tests.

PLANS

Continue to perform human exposure studies to identify the types of cottons and cotton dust components that cause byssinosis. Determine effects of particle size distribution on pulmonary function. Determine relationship of bacteria and other microorganisms to changes in pulmonary function.

ACCOMPLISHMENTS

Mild water washing of cotton eliminates acute response of human subjects to cotton dust

Three methods are used to wash cotton on a continuous washing system: (1) hot water only, (2) hot water with 1.2% bleach and (3) hot water with 1.2% bleach and 7.5% sodium hydroxide. Human subjects were exposed to controlled concentrations of dust generated from cotton subjected to the three washing methods and from the same cotton, but unwashed. Pre- and post-shift spirometry were performed to determine acute changes in pulmonary function. All washing methods produced significantly lower decrement in FEV than did the unwashed cotton but there were no differences between the washing methods. However, dust from cotton washed by the simplest method (hot water only) was the only washing method to produce a ventilatory response no different from that of clean air. Washing of cotton with water alone has much greater potential for commercial feasibility in the textile industry than does washing with bleach and/or alkali. An added benefit of washing is the significant reduction of dust concentrations during processing.

PUBLICATIONS

SEPULVEDA, M. J., J. L. HANKINSON, R. M. CASTELLAN, AND J. B. COCKE. Cotton-induced bronchoconstriction detected by a forced random noise oscillator method. *Brit. J. Ind. Med.* Accepted for publication.

SEPULVEDA, M. J., R. M. CASTELLAN, J. L. HANKINSON, AND J. B. COCKE. Acute lung function response to cotton dust in atopic and non-atopic individuals. *Brit. J. Ind. Med.* Accepted for publication.

BOEHLECKE, B., ET AL. Relationship between changes in FEV and endotoxin concentration during experimental cotton dust exposures. *Proc. Inter Conf. on Occup. Lung Disease*, Chicago, IL. Raven Press. In press.

SASSER, P. E., AND H. H. PERKINS, JR. Washing cotton to remove dust. *Trans. ASME, J. Eng. for Industry*. June 1983. In press.

BRAGG, C. K., H. E. PERKINS, JR., AND R. M. CATELLAN. Pulmonary function response to cottons from different growing areas. *Proc. 7th Cot. Dust. Res. Conf. Beltwide Cot. Prod. Res. Conf.*, Nat. Cot. Council, Memphis, TN. January 1983.

BERNI, R. J., J. G. MONTALVO, JR., H. H. PERKINS, JR., AND S. BUCO. Differentiation of washed and unwashed cotton. *Proc. 7th Cot. Dust. Res. Conf. Beltwide Cot. Prod. Res. Conf.*, Nat. Cot. Council, Memphis, TN. January 1983.

MILLNER, P. D., ET AL. Microbiological characterization of dusts from standard and washed cottons. *Proc. 7th Cot. Dust Res. Conf. Beltwide Cot. Prod. Res. Conf.*, Nat. Cot. Council, Memphis, TN. January 1983.

COCKE, J. B., CASTELLAN, R. M., SASSER, P. E., AND HANKINSON, J. L. Pulmonary function response to washed and unwashed cotton. *Proc. 7th Cot. Dust Res. Conf. Beltwide Cot. Prod. Res. Conf.*, Nat. Cot. Council, Memphis, TN. January 1983.

OLENCHOCK, S. A., ET AL. Endotoxins and acute pulmonary function changes during cotton dust exposures. *Proc. 7th Cot. Dust Res. Conf. Beltwide Cot. Prod. Res. Conf.*, Nat. Cot. Council, Memphis, TN. January 1983.

EXTRAMURALS

7820-20830-002A Effects on the human 01 Jun 88 C. K. Bragg
U. of Carolina respiratory system of ADODR
B. A. Boehlecke exposure to dusts from agricultural products

PROGRESS

A facility for controlled exposure of a limited number of human subjects to cotton dust extracts and aerosols was developed. Equipment for generating and monitoring cotton dust at controlled levels was devised and calibrated. A system for efficient collection and analysis of pulmonary function data was developed. Preliminary tests indicate all facilities and equipment are functioning reliably. Panels of subjects are being selected for human exposure studies.

PLANS

Perform human exposure studies in a clinical environment to identify cottons and components of cotton dust that cause byssinosis.

PUBLICATIONS

None.

Cotton Pathology Research Unit
P.O. Box JF
College Station, TX 77841
Alois A. Bell, Research Leader

7302-20830-001 (100% direct)	Fundamental research on bioassays and causative agents of byssinosis	31 Aug 85	A. A. Bell G. S. Elissalde R. D. Stipanovic R. L. Ziprin	10 50 40 30
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PROGRESS

Improved high performance liquid chromatography methods were developed to measure lacinilenes and cadalenes or terpenoid aldehydes in cotton dust. All terpenoid aldehydes were separated from each other, but hemigossypol and its methyl ether were not separated from their deoxyprecursors. Less than 50 ppm of lacinilene C methyl ether was found in bracts of various cultivars, and similar small amounts occurred in cotton dust. Gossypol, heliocide H₁ and heliocide H₂ occurred in appreciable concentrations in both bracts and mill dust. Heliocides H₁ and H₂, and gossypol stimulated significant degranulation and histamine release from mast cells of rat at concentrations well below those found in mill dust. Various flavonoids found in cotton dust also were evaluated for effects on mast cells, but only isoquercitrin caused significant degranulation at concentrations found in dust. Condensed tannins were tentatively identified as the agent in aqueous bract extracts, that stimulate contraction of cockroach hindgut muscle. Various terpenoid aldehydes and terpenoid- and tannin-free mill dusts were prepared and furnished to various other laboratories.

PLANS

A concentration series of tannins, prepared with the albumin-phenol method, and pure terpenes will be added to macrophage, platelet, and mast cell assay systems. Prostaglandin E_{2a} production, platelet aggregation, thromboxane production, and histamine release will be measured in the appropriate system. Established techniques will be used to qualitate and quantitate the lacinilenes and terpenoid aldehydes in cotton dusts, fiber, and plant parts. Effects of cotton genotypes, cultural practices, and insect and disease damage on bacterial and endotoxin content of fiber will be determined.

PUBLICATIONS

BELL, A. A., AND R. D. STIPANOVIC. Biologically Active Compounds in Cotton: An Overview. Proc. 7th Cot. Dust Res. Conf. 77-80. (1983)

ELISSALDE, M. H., JR., R. D. STIPANOVIC, A. A. BELL, AND G. S. ELISSALDE. Degranulation of Mast Cells by Terpenoid Aldehydes in Cotton Mill Dust. Proc. 7th Cot. Dust Res. Conf. 84-85. (1983)

ELISSALDE, G. S., M. H. ELISSALDE, AND K. HERTEL. Identification Quantitation of Gram-Negative Bacteria from Cotton Dust. A Comparison of the Bioassays Currently Used in Byssinosis Causative Agent Research. Cotton Inc., North Carolina, 3 pp (1983)

ELISSALDE, M. H., G. S. ELISSALDE, AND A. A. BELL. The Effects of Aqueous Extracts of Standard Dust on Mast Cell Degranulation. A Comparison of the Bioassays Currently Used in Byssinosis Causative Agent Research. Cotton Inc., North Carolina, 4 pp (1983)

GREENBLATT, G. A, AND R. C. BEIER. A Reevaluation of Endogenous Levels of Lacinilene C 7-methyl Ether in Bracts of the Genus *Gossypium*. J. Liq. Chromatog. 6: 917-926. (1983)

GREENBLATT, G. A., AND R. L. ZIPRIN. The Effect of Dust and Bract Extracts on Alveolar Macrophage Prostaglandin Production and Cockroach Hindgut Muscle Contraction. Proc. 7th Cot. Dust Res. Conf. 86-88. (1983)

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1103-20793-008 (100% direct)	Microorganisms as a possible cause of byssinosis, a pulmonary disease of cotton millworkers	05 May 86	P. B. Marsh M. E. Simpson P. D. Millner	40 100 10
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PROGRESS

In calendar year 1983, Beltsville microbiologists pressed forward with the definition of field conditions which influence the occurrence of possibly-byssinogenic bacteria on cotton fiber in field exposures. New data validated earlier information linking high bacterial levels on fiber in part to microbial tight locks, i.e., incipient boll rot, and strongly suggested the applicability of known boll rot control procedures to the byssinosis problem, also suggested the possible applicability of procedures for excluding microbial tight locks at the gin. After the fiber has fluffed, prompt harvest may be urgently important, since as little as one week of humid exposure may cause development of high bacterial levels on the fiber. Determination of fiber pH offers much promise as a very rapid, practical, indirect means for detecting fiber with high bacterial levels, possibly with simultaneous diagnostic determination of reducing sugar in the fiber with dinitrosalicylic acid ("DNS test"). Literature has been reviewed preparatory to experimentation in a related pure-science area, i.e., on cellulose-decomposing activity among fungal xerophytes.

PLANS

Continue general approach of investigating influence of causative factors on populations of suspectedly-byssinogenic microorganisms on raw cotton and on methodology for enumerating same.

No major departures from previously approved plans but with increasing attention to (a) indirect methods of detecting microorganisms and (b) relations of fiber populations to seed populations, including suggested mycotoxin producers.

ACCOMPLISHMENTS

Improved methodology for determining microbial populations on cotton. Improved knowledge on factors influencing such microbial populations.

Increasingly precise information on relation of weather variables to fiber microbiology was obtained. Significant progress was made toward use of fiber pH and reducing-sugar content as rapid indirect procedures for detection of

high bacterial count cottons; relations of such cottons to boll rot confirmed and extended. Information on relations of fiber fluorescence to Aspergillus flavus and aflatoxin in seed extended and summarized in a review of 30 years work. This information is needed by researchers who are studying the effects of cotton dust in human exposure studies and in the interpretation of the data from those studies in the model cardroom at Clemson, SC. It is also needed by producers and processors in their attempt to alleviate or prevent detrimental effects on byssinotics among cotton millworkers.

PUBLICATIONS

SIMPSON, M. E., P. B. MARSH, A. C. GRIFFIN, JR., S. I. RAYBURN, JR., AND J. M. HALLOIN. Recent Advances in Microbiology of Cotton Relevant to Byssinosis. I. The Bacteria. Proc. 7th Cot. Dust Conf. (1983)

SIMPSON, M. E. AND P. B. MARSH. Recent Advances in Microbiology of Cotton Relevant to Byssinosis: II. The Fungi. Proc. 7th Cot. Dust. Conf. (1983)

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SIMPSON, M. E. AND P. B. MARSH. Further Counts of Bacteria on U.S. Commercial Raw Cotton Fiber. Text. Res. J. 54: 231-237 (1984)

RAYBURN, S. T., JR., E. P. COLUMBUS, AND M. E. SIMPSON. Bacteria on Fiber from Seed Cotton Stored in Modules. Trans. Am. Soc. Agr. Eng.

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7313-20190-004 Foreign material reduc- 02 Oct 84 A. D. Brashears 90
(60% direct) tion in stripper harvested
cotton

PROGRESS

Sticks in bur cotton were reduced 50% by using shorter rubber paddles in alternative brush rubber paddle harvesting system. Harvesting efficiency was not affected by the modification. Tapered rotating brushes used to replace plant lifters were effective in lifting low bolls but excessive lint build-up on brushes will require modifications and design. Development of a one row harvester has provided an easier method for evaluating experimental stripper modifications and effect of plant characters on obtaining quality lint during harvest. Removal of bract from bolls prior to dehiscing was found not to reduce dust in model card room or affect subjects on human exposure panel. The second planting in two years of closed capsule cotton was lost to high wind and blowing sand. The closed capsule cotton was to be evaluated for reducing fine trash in bur cotton.

PLANS

Determine the effect of mechanical harvesting systems and hand harvesting on cotton dust in bur cotton, lint, and cotton seed.

Continue evaluation of modified rubber paddles. Studies will be directed toward various plant sizes and moisture conditions.

Evaluate closed boll cotton systems for producing clean cotton and develop parameters for design of harvester for closed boll concept.

Continue evaluation of rotating brushes as plant lifters. Improved plant lifters will reduce foreign material in bur cotton for early maturing cotton varieties.

PUBLICATIONS

BRASHEARS, A. D. Modification of Pneumatic Fractionator to Collect Bur Cotton Fine Material. Trans. ASAE 26: 242-245. (1983)

WANJURA, D. F. AND A. D. BRASHEARS. Factors Influencing Cotton Stripper Performance. Trans. ASAE 26: 54-58. (1983)

McMICHAEL, B. L. AND A. D. BRASHEARS. Device for Removing Mini-Rhizotrons from the Field. *Agron. J.* 75: 712-714. (1983)

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BAKER, R. V., A. D. BRASHEARS, J. W. LAIRD, AND J. E. QUISENBERRY. Genetic Effects on Ginning Performance. Presented 1983 Beltwide Cotton Production Research Conference. Abstract published in proceedings p. 101.

LAIRD, W., R. V. BAKER, J. E. QUISENBERRY, AND A. D. BRASHEARS. Genetic Effects Related to Cotton Yield and Quality. Presented 1983 Beltwide Cotton Production Research Conference. Abstract published in proceedings p. 101.

QUISENBERRY, J. E., R. E. DILBECK, J. W. LAIRD, A. D. BRASHEARS, AND R. V. BAKER. Morphological Traits Related to Harvest and Gin Performance. Presented 1983 Beltwide Cotton Production Research Conference. Abstract published in proceedings p. 101-102.

7313-20550-004 (70% direct) (30% indirect)	Interaction of cotton plant and fiber characteristics with mechanical cleaning	20 Dec 85	R. V. Baker J. W. Laird A. D. Brashears G. L. Barker	20 10 10 10
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PROGRESS

Seventy-nine strains of stripper harvested cotton were evaluated in a study to determine the effects of selected genetic characters on seed cotton, foreign material, cleaning efficiency, ginning rate, lint cleaner performance, and dust content of ginned lint. Genetic factors accounted for 31 to 62 percent of the foreign material variations in machine harvested cotton. The performance of the gin's seed cotton cleaning system was related to ten genetic factors, which accounted for 40 to 60 percent of the variation in bur-, stick-, and fine trash-removal efficiency. Lint cleaner efficiency was not closely associated with any of the genetic factors evaluated in this study; however, foreign matter content of ginned lint was related to several plant and fiber characters. Eight factors explained about 67 to 70 percent of the variation in lint foreign matter before and after lint cleaning, and nine genetic factors explained about 70 percent of the variation in dust content. Ginning rate was closely related to those factors which characterize the seed and the relative proportions of seed and lint. These factors along with moisture content explained about 50 percent of the variation in ginning rate.

PLANS

Twelve of the original 79 strains of cotton used in the initial study will be retested to check and verify regressions developed for several ginning performance measurements. Testing procedures will be identical to those employed in the original study.

PUBLICATIONS

BRASHEARS, A. D., J. E. QUISENBERRY, R. V. BAKER, AND J. W. LAIRD. Genetic Effects on Stripper Harvested Bur Cotton. Presented 1983 Beltwide Cotton Production Research Conference. Abstract published in proceedings, p. 101.

BAKER, R. V., A. D. BRASHEARS, J. W. LAIRD, AND J. E. QUISENBERRY. Genetic Effects on Ginning Performance. Presented 1983 Beltwide Cotton Production Research Conference. Abstract published in proceedings, p. 101.

LAIRD, W., R. V. BAKER, J. E. QUISENBERRY, AND A. D. BRASHEARS. Genetic Effects Related to Cotton Yield and Quality. Presented 1983 Beltwide Cotton Research Conference. Abstract published in proceedings, p. 101.

QUISENBERRY, J. E., R. E. DILBECK, J. W. LAIRD, A. D. BRASHEARS, AND R. V. BAKER. Morphological Traits Related to Harvest and Gin Performance. Presented 1983 Beltwide Cotton Production Research Conference. Abstract published in proceedings, p. 101-102.

7313-20550-005 (70% direct) (30% indirect)	Improved cleaning sys- tems for machine- stripped cotton	20 Dec 85	R. V. Baker J. W. Laird	80 90
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PROGRESS

Bulk seed cotton reclaiming concepts were evaluated and found to offer little advantage over conventional single-stage systems. Fine-tooth saw cylinders and brush grids improved by about 12 percent the foreign matter removal efficiency of a three saw stick machine. Electrical power requirements were determined for starting and operating a seed cotton separator, inclined cleaner, CBS machine, stick machine, and a lint cleaner. The effects of multiple lint cleaning on bale value and fiber quality were determined for six common stripper cultivars. Lint cleaning tended to slightly reduce staple length, micronaire, UHM length, and length uniformity, but tended to slightly increase HVI strength measurements. A carding method for cleaning lint at the gin was more efficient in removing visible trash and dust than were two conventional lint cleaners. The carding technique consistently produced grades of middling or higher and greatly reduced bark contamination of lint. Results suggest that a possibility exists for combining some of the efficient cleaning features of a carding process with the high-capacity features of gin-type cleaners to improve overall cleaning performance.

PLANS

Continue to investigate means of utilizing carding principles for cleaning lint at the gin. Multiple saw lint cleaning devices with carding mechanisms will be studied to determine effects on cleaning performance and fiber quality. The effects of feeding angle for seed cotton reclaimers will be investigated in studies designed to overcome the reclaiming deficiencies of unit bur and stick extractors.

PUBLICATIONS

BAKER, R. V., W. F. LALOR, AND J. W. LAIRD. Lint Retrieval at Ginning: Further Study of Bale Weight and Spinning Performance. Text. Res. J. 53: 98-102 (1983)

LAIRD, J. W. AND R. V. BAKER. Heat Recapture for Cotton Gin Drying Systems. Trans. ASAE 26: 912-917 (1983)

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MAYFIELD, W. D., R. V. BAKER, S. E. HUGHS, AND A. C. GRIFFIN. Ginning Cotton to Preserve Quality. USDA Ext. Serv. P.A. No. 1323, 11 pp. (1983)

7313-20550-006 Production, ginning and 21 Dec 83 R. V. Baker 00
 quality studies on non- J. W. Laird 00
 dehiscent-boll cotton

PROGRESS

Response data was developed for the initial drying of closed cotton bolls under low airflow conditions and at temperatures of 50 and 70 degrees F and at relative humidities of 30 to 70 percent. Exploratory studies were conducted to investigate three novel techniques for ginning naked seed cotton. A hybrid saw/roller ginning device successfully ginned 80 percent of the seed in a one pass operation. Results suggest that the desirable characteristics of each type of gin might be incorporated into such a device to improve fiber quality and cleanliness.

PLANS

Any future research on nondehiscent-boll cotton will be carried out under CWU 7313-20550-004.

PUBLICATIONS

None.

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7402-20550-004 (40% direct)	Production, ginning and quality studies on Mid-south cotton varieties	25 Mar 86	S. T. Rayburn	30
			A. C. Griffin	70
			G. J. Mangialardi	10
			W. S. Anthony	10

PROGRESS

A multidisciplinary variety, harvesting, ginning experiment in 1983 showed that relatively smooth-leaf cotton yielded higher market grades and more farmer income than more hairy-leaf types when ginned on the conventional two lint cleaner gin. A 1982 gin survey also showed that relatively smooth-leaf cotton on 2-lint-cleaner gins yielded more high lint grades than some hairy cottons on 3-lint-cleaner gins. Trichome counts on isolines of a popular cultivar were highly correlated with visible foreign matter in lint and resulting lint market grades. These findings are important in that grower selection of relatively smooth-leaf varieties should increase market value and manufacturing quality because the gin processing machinery level can be reduced. Completed 3-year study of the effect of fiber strength on short fiber content in lint ginned with multiple stages of lint cleaning. The stronger cottons tended toward fewer short fibers at all stages of ginning and lint cleaning. Such lint should result in stronger, smoother yarns.

PLANS

Continue study of the effect of cotton leaf and bract hairiness on lint grades at various levels of gin cleaning.

Continue development of methods to scientifically categorize hairiness level, and to classify cotton cultivars according to hairiness level. This work is cooperative with Cotton Physiology Research at Stoneville.

Continue development of computer software for gins aimed at producing optimally profitable lint grades based on gin machinery and cotton interactions.

Continue multidisciplinary research using selected cotton cultivars, harvest-methods, and selected lint cleaning levels to broaden the data base established in 1983. We need more observations on the effect of growing conditions and weather exposure using the controlled treatment outline described herein.

ACCOMPLISHMENTS

Cottons of low hairiness levels yield higher lint grades while using less gin cleaning machinery.

By using replicated experimental treatments of cotton varieties, preharvest treatments, harvesting patterns, and ginning with four levels of lint cleaning, we found that cottons with low levels of hairiness yielded higher grades of ginned lint than the more hairy varieties. Only one stage of lint cleaning was required for SLM grades among the less hairy cottons while two or more stages of lint cleaning were required to produce SLM grades from the more hairy cottons. Field tests at five commercial gins substantiated that less hairy cottons produce a significantly higher proportion of high grade cotton on 2-stage lint cleaner gins than hairy cotton. Trichome counts on leaves from strains of STV 213 showed very high correlations between numerical hairiness level, visible foreign matter in ginned lint, and lint grade classification.

PUBLICATIONS

GRiffin, A. C., JR. Ginning and Quality Characteristics of Cotton with Low Fiber-To-Seed Attachment Strength. The Cotton Ginners J. & Yearbook 51: 3-9 (1983)

RAYBURN, S. T., JR., AND L. M. LIBOUS. Preliminary Investigation of Cleanability of Cotton with Varying Degrees of Plant Hairiness. Proc. 7th Beltwide Cot. Prod. Res. Conf. p. 152. (1983).

LUCKETT, E. E. AND S. T. RAYBURN. Module Storage of Picked and Stripped Seed Cotton. Proc. 7th Beltwide Cot. Prod. Res. Conf. 140-142. (1983)

SIMPSON, E., P. B. MARSH, S. T. RAYBURN, A. C. GRIFFIN, AND J. M. HALLOIN. Recent Advances in Microbiology of Cotton Relevant to Byssinosis. I: The Bacteria. Proc 7th Beltwide Cot. Prod. Res. Conf. 45-49. (1983)

GRiffin, A. C., JR., AND W. F. LALOR. The Effect of Fiber Bundle Strength on the Short Fiber Content and Nepping Potential of Ginned Lint. Textile Praxis. Accepted for publication.

7402-20550-005 (20% direct)	Ginning machinery and methodology to preserve fiber quality	02 Aug 87	W. S. Anthony G. J. Mangialardi A. C. Griffin S. T. Rayburn E. D. Columbus	70 90 30 70 50
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PROGRESS

An infrared based commercial moisture meter was found to give reliable moisture measurements and that can be readily adapted to gin use. A gin management computer model was improved by adding engineering parameters for projecting the impact of estimated annual ginning volume on gin operating costs. A dynamic gin simulation model indicated that lint market price fluctuations of 5 cents per pound do not require changing the optimum ginning machinery complement when ginning for maximum bale value. Condenser drums covered with anti-pollution wire screen did not cause lower market grades due to increasing the foreign matter level of ginned lint. The USDA fiber retriever recovered 14.5 pounds of good fiber concurrently with ginning when using three stages of saw cylinder lint cleaning, thereby improving bale weight by nearly 3 percent. Visual nep counts in ginned lint established no firm trend in nep level among 20 varieties from Mississippi and California.

PLANS

- a. Through systematic analysis of saw gin stand design the relationship of gin saws to the seed roll and rib slots will be examined for creating neps and other imperfections in ginned lint.
- b. Continue evaluation of the effects of cotton types and production practices on the nepping potential of ginned lint through cooperative work with cotton breeders and harvesting researchers.
- c. An infrared moisture sensor will be adapted for gin use to aid researchers and commercial ginners in close control of lint quality.
- d. Determine whether cotton drying by using microwave energy causes different effects on cotton quality than drying seed cotton by using heated air.
- e. Continue development of HVI measurements as indices to gin performance and lint quality.
- f. Examine the hypothesis that increasing the density of saw teeth in lint cleaners will result in higher cleaning efficiency.
- g. Develop technology to prevent the occurrence of seed coat fragments in ginned lint.

ACHIEVEMENTS

Computer software for gins aid economic management decisions

Development of a computer program for analyzing (1) the effects of projected annual volume which is influenced by USDA crop reduction programs and weather disasters, and (2) the effects of market prices for ginned lint of specific grades, will make feasible the advance determination of ginning costs and thereby charges per bale to be assessed to growers for ginning cotton. These programs will also show at what market price differentials a ginning machinery sequence should be adjusted to give maximum cash return to the cotton grower.

PUBLICATIONS

GRIFFIN, A. C. AND G. J. MANGIALARDI, JR. Lint Retrieval at Ginning: Further Study of Bale Value and Spinning Performance--Midsouth Experiments 1981. *Textile Res. J.* 53: 92-97 (1983)

MANGIALARDI, G. J., JR., AND J. B. COCKE. Effects of Fiber Retrieval On The Quality and Value of Spindle-Picked Cotton. *USDA-S-33.*

MONTALVO, J. G. AND G. J. MANGIALARDI, JR. Systematic Errors in Shirley Analyser Measurements. *Textile Res. J.* 53: 408-414 (1983)

ANTHONY, W. S. Response of Fiber Properties to Gin Machinery and Moisture during Ginning as Measured by HVI. *Trans. ASAE* 105:1-5 (1983)

ANTHONY, W. S. Vacuum Microwave Drying of Cotton: Effect on Cottonseed. *Trans. ASAE* 26: 275-278 (1983)

ANTHONY, W. S. Energy Utilization and Conservation in Cotton Gins. *The Cotton Gin Oil Mill Press* 84(1): 6-11 (1983)

ANTHONY, W. S. Increasing Producer Returns by Gin Control. *Proc. 7th Beltwide Cot. Prod. Res. Conf.* 300-303 (1983)

ANTHONY, W. S. AND W. D. MAYFIELD. Influence of the Payment-in-Kind Program on Ginning Costs. *The Cotton Gin Oil Mill Press* 83(23): 10-12 (1983)

7402-20550-007 (80% direct)	Improving the working environment in cotton gins	31 Jul 85	W. S. Anthony E. P. Columbus	20 50
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Acoustical damping compounds applied to centrifugal fan housings reduced the amount of noise radiated by dbA. This reduction is insufficient to protect against human hearing loss. Lint cleaners were more efficient than seed cotton cleaners in removing respirable dust from cotton fibers. Controlled reductions in processing rates of lint cleaners gave only small reductions in card room airborne dust levels while significantly reducing visible waste and increasing market grades. Air wash applied to lint cleaner grids improved lint market grades but resulted in only a trend toward lower card room dust levels. Measurement of gram-negative bacteria (GNB) in bales of ginned lint stored dry for 6 months showed a decline in colony forming units as storage time increased, but storage under dry conditions had no effect on endotoxin levels. GNB levels decreased in module stored spindle-picked cotton over 8 weeks of dry storage.

PLANS

- a. Exhaust canopies will be designed and tested for controlling the amount of cotton dust and lint fly in the baling press area of cotton gins.
- b. Airfoil-type cutoffs will be designed to control the level of noise emitted by high speed gin fans.
- c. A smooth-leaf strain of cotton will be compared to its genetic hirsute counterpart to determine whether the degree of hirsuteness is a factor in dust generation during ginning.

We are discontinuing our research into the causative agents of byssinosis except on request by another agency/unit.

PUBLICATIONS

ANTHONY, W. S. Economical Control of Cotton Conveyance Noise with Visco-elastic Materials. The Cotton Gin and Oil Mill Press 84:(17) 6-10 (1983)

ANTHONY, W. S. AND E. P. COLUMBUS. Control of Fine Dust From Gin Extractor Feeders. Trans ASAE 26: 1020-1033 (1983)

COLUMBUS, E. P., N. M. MORRIS, AND S. T. RAYBURN. Arsenic in Lint and Cotton Gin Emissions. Trans. ASAE 546-549 (1983)

MANGIALARDI, G. J., JR. Closed Boll Drying for Gin Processing. Trans. ASAE. Accepted 7-12-83.

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